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ABSTRACT

In order to assess the classroom behavior of PLAN students relative to students in other instructional systems, the PLAN Student Observation Scale (PLAN-SOS) was developed. Specifically, PLAN-SOS was designed to measure the percentages of time that students spend performing various behaviors judged to be important to the learning process in a system of individualized instruction. Twenty categories of behavior were described, clustered under the general headings of either working alone, interacting in a group, interacting with the teacher, interacting with a peer, planning learning strategies, transitional behavior, or non-productive behavior. Two groups of observers were trained to use PLAN-SOS. The results these observers obtained using the scale are described in this report. A reference list and data tables are appended. (JY)

CLASSROOM BEHAVIOR OF PLAN STUDENTS COMPARED WITH CONTROL STUDENTS

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In the development of an individualized system of instruction such as PLAN and in the training of teachers to individualize their instruction, it is, quite obviously, important to learn what happens to the students. Obtaining and storing student performance data is integral to the PLAN system. Teachers daily report student progress to the computer and students almost as frequently report their own progress. To this end product of information regarding student achievement, we have added an intermediate source of student data, namely observational data concerning student classroom behavior.

In order to assess the classroom behavior of PLAN students relative to students in other instructional systems, the PLAN Student Observation Scale (PLAN-SOS) was developed. The purpose of PLAN-SOS is to measure the percentage of time that students spend performing various behaviors judged to be important to the learning process in a system of individualized instruction.

Many student observation scales have been developed for a variety of specific uses. Some have been designed to record the occurrence of a circumscribed set of student classroom behavior such as attending behavior (Walker & Buckley, 1968), study behavior (Hall, Lund, & Jackson, 1968), and disruptive behavior (Thomas, Becker, & Armstrong, 1968). Other scales have been constructed to examine a broader group of behaviors. Spaulding, for example, developed "A Coping Analysis Schedule for Educational Settings" (CASES) to record both verbal and non-verbal behaviors in the affective domain (Simon & Boyer, 1967). Another scale was developed by Lindvall specifically for the observation of students in an individualized system of instruction (Simon & Boyer, 1967).

PLAN-SOS was designed to correspond to the training program for teachers of PLAN classes. The scale, therefore, is intended to assess the influence of teachers and the PLAN instructional system on student behavior. This paper will briefly describe the development and implementation of PLAN-SOS and then present some preliminary comparisons between PLAN and Control students.

Brief Description of PLAN-SOS

Listed below are the 20 categories of the PLAN-SOS. They represent the end product of the development of mutually exclusive and exhaustive categories that observers may employ to reliably and usefully describe activities of PLAN students.

Student Behavior Categories

Category Description	Category Number	Example
WORKING ALONE ON		
Computer materials	(1)	The student fills out a computer request card.
Learning materials	(2)	The student checks off a TLU activity.
Learning equipment	(3)	The student is listening through earphones to a record.
Tests	(4)	The student is writing an essay answer to a test.
INTERACTING IN A GROUP		
Attending to the teacher	(5)	The student is watching the teacher work a problem.
Attending to a student	(6)	The student is attending to another student in the group who is asking a question.
Talking or performing	(7)	The observed student is answering a question asked by the group leader.
INTERACTING WITH THE TEACHER		
Content behavior (intra TLU)	(8)	The student asks the teacher for the meaning of a word in his TLU.
Process behavior (extra TLU)	(9)	The student answers the teacher's question about how far he has progressed in his Program of Studies.

Silent attending	(10)	The student listens to the teacher explain something to him.
INTERACTING WITH A PEER		
Content behavior (intra TLU)	(11)	The student asks another student how to work a math problem.
Process behavior (extra TLU)	(12)	The observed student tells another student where to find a book.
Silent attending	(13)	The observed student attends to another student who is asking a question.
PLANNING LEARNING STRATEGIES OR PROGRAM OF STUDIES	(14)	The student and teacher are discussing the student's Program of Studies.
TRANSITIONAL BEHAVIOR		
Walking	(15)	The student is walking from his desk to the bookcase.
Waiting for the teacher	(16)	The student is standing in line at the teacher's desk.
Other waiting	(17)	The student is waiting to use a tape recorder.
Locating or organizing materials and equipment	(18)	The student is putting earphones on his head.
NON-PRODUCTIVE BEHAVIOR		
Interacting	(19)	The student is describing to another student the details of a TV program.
Not interacting	(20)	The student is gazing out the window.

The 20 categories of PLAN-SOS are clustered into seven groups which correspond to the major emphases of the teacher training program. These include training teachers to teach children how to manage their own classroom behavior (Categories 1, 2, 3, 4, 11, 12, 13, and 18), training teachers how to work with small groups of children (Categories 5, 6, and 7), training teachers how to work

individually with children (Categories 8, 9, and 10), and training teachers how to teach children to plan their own studies (Category 14). Categories nine and 12, "Process Behavior," represent tutoring sessions which focus on problems of organizing the student's work and preparing for the learning activities. Categories 8 and 11, "Content Behavior," represent tutoring sessions which focus on problems of the actual learning activities themselves.

Training Classroom Observers to Use the Scale

Four observers were trained to use the PLAN-SOS and the training procedure was replicated with a second group of four observers. All observers in both groups were women. Those in the first group ranged in age from 23 to 35; their education ranged from one year of college to one and one-half years of graduate study. Two had had no teaching experience, one had taught three years in public school and one observer had taught five years. The second group ranged in age from 25 to 41. One had attended college for three years and the other three each had earned a Bachelor's Degree. The number of years teaching experience represented in the group was none, one, two, and four years.

A brief outline of the training program is presented in Table 1. The objective of the observer training was to attain inter-observer reliability of .85 or better as quickly and economically as possible. Observers were given extensive practice categorizing first written narratives describing student behavior and then observing and categorizing actual student classroom behavior. Training included frequent assessment of observer progress and feed-back regarding observer successes and solutions to observation problems. Observers were given practice in all levels of PLAN classes and also in all corresponding levels of non-PLAN classes.

Following the training of each group a reliability study of the instrument was conducted. Scott's π was employed as the statistic to assess reliability (Flanders, 1967). Reliabilities of Group I observers are presented in Table 2 and those of Group II observers are presented in Table 3.

Data Collection

For a complete description of the observed population see the paper by Quirk, Steen, and Lipe (1969). The distribution of Project PLAN and Control classes is presented in Table 4.

Each classroom of this study was observed on three separate occasions each for 20 minutes to provide a total of one hour's observation on each class of students. A pair of observers entered each classroom. One member of the pair observed and recorded teacher behavior; the other observed and recorded student behavior. The student observer systematically scanned the classroom, observed and recorded the behavior of a different student every five seconds until every student's behavior had been recorded once, and then rescanned the classroom observing every student a second time. This process was repeated for the duration of the 20 minute observation period.

Hypotheses

The rationale for training teachers in PLAN classes provides the support for the hypotheses regarding student behavior. It is hypothesized that the training program will influence teachers' classroom behavior of students so that students may function effectively in the PLAN instructional system.

For a complete discussion of the training program see Steen, Lipe, and Quirk (1969), and Quirk, Steen, and Lipe (1969). The training program emphasized the role of teachers in teaching students how to manage their own learning

activities using computer materials, learning materials, and learning equipment. Teachers were given instruction in tutoring individual students with special emphases on helping students to learn the processes involved in self-paced instruction. The teacher training program also emphasized the role of teachers in teaching students how to work productively with other students to resolve both process and content learning problems. Each student in PLAN has an individualized Program of Studies which is a dynamic document subject to change as the student's needs change. Teachers were given training in helping students to use their Programs of Studies, to make pertinent changes in their Programs of Studies, and to develop new learning strategies to help meet target dates in their Programs of Studies.

It must be emphasized that effective learning behavior in PLAN classes would not necessarily be the most effective student behavior in non-individualized classes. The following hypotheses, therefore, refer to control classes as a baseline for comparison and do not intend to reflect how the students in control classes should behave.

Hypothesis One: "Working Alone on Learning Activities"

PLAN intermediate and secondary level students and PLAN students at all levels combined spend more time than Controls working alone on computer materials. (Computer IBM cards for 1968-69 were not yet designed for use by primary students.)

PLAN students at all levels and at all levels combined spend more time than Controls working alone on learning materials and on learning equipment.

Hypothesis Two: "Interacting with Teacher"

PLAN students at all levels and at all levels combined receive more individual instruction from teachers regarding process problems than the Control students receive.

Hypothesis Three: "Interaction with Peers"

PLAN students at all levels and at all levels combined spend more time than Controls receiving and/or giving help to peers regarding both content and process learning problems.

Hypothesis Four: "Planning Learning Strategies or Program of Studies"

PLAN students at all levels and at all levels combined spend more time than Controls planning Programs of Studies (POS) and developing strategies to complete their Programs of Studies.

Data Analyses

Comparisons between PLAN and Control students are presented in Tables 5 - 9 and Figures 1 - 2. Percentage of time spent in all 20 categories of behavior and in six grouped categories are presented in the tables and figures and the Mann-Whitney U values are shown for those categories relevant to the four hypotheses. All tests of significance of the U values were one-tailed tests. In order to increase the number of classrooms in the compared groups, grades one and two were combined in Table 5 for the primary level, grades four and five were combined in Table 7 for the intermediate level, and grades nine and ten were combined in Table 8 for the secondary level comparisons.

Hypothesis One: Working Along on Learning Activities

PLAN intermediate and secondary students and students at all levels combined spent significantly more time than Control students on computer materials. This indicates that PLAN students were, in fact, using the computer information and materials to a significant degree. PLAN primary and secondary level students and

PLAN students at all levels combined spent significantly more time than Control students working alone on learning materials. The difference between PLAN and Control intermediate students was in the predicted direction but it was not significant. PLAN primary and intermediate level students and PLAN students at all levels combined spent significantly more time than Control students working alone on learning equipment. At the secondary level the difference was in the predicted direction but it was not significant.

Within the "Working Alone" group, categories two and three were combined at the primary level and categories one, two, and three were combined at the intermediate and secondary levels and for all levels together. Differences between PLAN and Control groups were then tested and the results are presented in Table 6. PLAN primary students spent significantly more time than Controls working alone on learning materials or on learning equipment. PLAN intermediate and secondary students and all PLAN students combined spent more time than Controls working alone on computer materials, on learning materials or on learning equipment.

Hypothesis Two: Interaction with Teacher

PLAN primary and secondary students and all PLAN students combined spent significantly more time than Controls discussing process problems with the teacher. The difference between PLAN and Control intermediate students was in the predicted direction but it was not significant.

Hypothesis Three: Interacting with Peers

PLAN students at all levels and at all levels combined spent more time than Controls interacting with peers discussing problems regarding the content of

learning activities. PLAN primary and intermediate students and all PLAN students combined spent significantly more time than Control students discussing process problems with peers. The difference between PLAN and Control secondary students' discussing process behavior was in the predicted direction but it was not significant.

Hypothesis Four: Planning Learning Strategies or Program of Studies

All differences between PLAN and Control students were in the predicted direction but none were significant. Neither PLAN primary, intermediate, or secondary students nor all PLAN students combined spent significantly more time than Controls in planning activities.

Summary and Discussion

The evidence strongly supports hypothesis one that PLAN students spend more time than Control students working alone on various learning activities. Also as predicted, PLAN students spent more time than Controls in individual instruction with their teachers discussing the processes involved in organizing their learning activities. In PLAN classes, students discussed both learning process and learning content with their peers to a degree significantly greater than in Control classes. Hypothesis four was not supported; PLAN students did not spend significantly more time than Control students planning learning activities and developing learning strategies to help follow the plan. Teaching students when and how to adjust their Program of Studies and how best to follow it will receive special attention in our teacher training program next year. Student observation data next spring will indicate whether student planning behavior indeed will have been influenced by our training program.

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Table 1

Brief Outline of the Observer Training Program

I. Pre-training Orientation Session (about two hours)
   A. Complete the "First Practice Trials Categorizing Student and Teacher Behavior".
   B. Read "Operational Definitions of Student Behavior Categories".
   C. Peruse materials describing Project PLAN.

II. Orientation to Project PLAN Classrooms (about one-half day)
   A. Take a clip board with stop watch and observation forms.
   B. In several PLAN classrooms the trainer will point out examples of the student behavior categories as they occur.

III. Simulated Practice (about one-half day)
   A. Practice categorizing written examples of student behavior.
   B. Practice tallying responses and computing Scott's π.

IV. Practice Observation with Frequent Feed-back (as needed)
   A. In pairs, in a functioning classroom, discuss student behavior (about five minutes).
   B. Independently categorize student behavior (two minutes).
   C. Compare and discuss categorization decisions.
   D. Repeat B and C for about 20 minutes.
   E. Outside the classroom discuss unresolved questions and problems with the trainer.

V. Trial Reliability (as needed)
   A. In pairs, independently observe students in diverse classrooms for about 20 minutes each.
   B. Computer observer reliability in each classroom.

VI. Formal Reliability Study of the Instrument

Table 2

Observer Reliability

PLAN-SCS

Group I

Grade Level Observed	Observer Pair	Scott's π			
		Project PLAN classes		Traditional classes	
Primary (Grades 1 & 2)	A-B	.96	.92	.86	.96
	C-D	.93	.99	.73	.88
Intermediate (Grades 4, 5, & 6)	A-C	.95	.76	.95	.90
	B-D	.98	.82	.96	.60
Secondary (Grades 9 & 10)	A-D	.95	.88	.86	.93
	B-C	.53	.98	.89	.95

Table 3

Observer Reliability

PLAN-SOS

Group II

Grade Level Observed	Observer Pairs	Scott's π			
		Project PLAN classes		Traditional classes	
Primary (Grades 1 & 2)	A-B	.88	.82	.74	.72
	C-D	.90	.97	.98	.91
Intermediate (Grades 4, 5, & 6)	A-C	.93	.81	.89	.95
	B-D	.93	.93	.93	.93
Secondary (Grades 9 & 10)	A-D	.80	.74	.00	.86
	B-C	.90	.93	.64	.67

Table 4

Distribution of Project PLAN and Control Classrooms

	Number of Elementary Classrooms by Grade Level				Number of Secondary Classrooms by Subject Taught				
	1	2	5	6	English	Social Studies	Math	Science	Total
Project PLAN Classrooms									
Number of Classrooms	12	12	12	12	5	5	4	4	66
Number Observed for One Hour	10	11	10	11	4	5	4	3	58
Control Classrooms									
Number Randomly Selected	5	5	5	5	3	3	3	3	32
Number Observed for One Hour	4	4	5	5	2	3	2	3	28

Table 5

Comparison of PLAN Primary Level Students with Control Primary Level Students

Category	Student Observation Scale					
	Frequency	Percent	Frequency	Percent	Mann-Whitney	
	PLAN Primary Students (N=21 classrooms)		Control Primary Students (N=8 classrooms)			
Working Alone					U	z
1. Comp. mat.	4	0.02	0	0.0		
2. Learn. mat.	5393	35.66	1374	23.85	39.5	2.17*
3. Learn. equip.	1013	6.69	105	1.82	25.5	2.86**
4. Tests	65	0.42	0	0.00		
Interacting in a Group						
5. Attend. to tch.	907	5.99	1926	33.43		
6. Attend to stud.	313	2.07	740	12.84		
7. Talk. or perf.	176	1.16	232	4.02		
Interacting with Teacher						
8. Content beh.	258	1.70	11	0.19		
9. Process beh.	51	0.33	7	0.12	45.5	1.92*
10. Sil. att.	488	3.22	52	0.90		
Interacting with Peers						
11. Content beh.	553	3.65	64	1.11	5.5	3.84**
12. Process beh.	56	0.36	0	0.00	20.0	3.29**
13. Sil. att.	395	2.61	27	0.46		
Other						
14. Plan. learn. strat.	19	0.12	0	0.00	68.0	1.30
Transitional						
15. Walking	1628	10.76	272	4.72		
16. Wait. for tch.	537	3.55	119	2.06		
17. Other wait.	46	0.30	47	0.81		
18. Loc. or org. mat.	1630	10.78	406	7.04		
Non-productive						
19. Interacting	978	6.46	231	4.01		
20. Not interacting	610	4.03	147	2.55		
Alone (1+2+3+4)	6475	42.82	1479	25.67		
Group (5+6+7)	1396	9.23	2898	50.31		
Teacher (8+9+10)	797	5.27	70	1.21		
Peer (11+12+13)	1004	6.64	91	1.57		
Trans. (15+16+17+18)	3786	25.03	844	14.65		
Non-prod. (19+20)	1643	10.86	378	6.56		
TOTAL (1 through 20)	15120		5760			

*p<.05
**p<.01

Table 6

Comparison of PLAN and Control Students

on Combined Categories

Combined Categories within the "Working Alone" group	Student Observation Scale					
	Frequency	Percent	Frequency	Percent	Mann-Whitney	
	PLAN Primary Students (N=21 classrooms)		Control Primary Students (N=8 classrooms)			
					U	z
2. Learn. mat. 3. Learn. equip.	6406	42.37	1479	25.68	20	3.12**
	PLAN Intermediate Students (N=21 classrooms)		Control Intermediate Students (N=10 classrooms)			
1. Comp. mat. 2. Learn. mat. 3. Learn. equip.	6371	42.14	2217	31.05	56.5	2.05*
	PLAN Secondary Students (N=16 classrooms)		Control Secondary Students (N=10 classrooms)			
					U	
1. Comp. mat. 2. Learn. mat. 3. Learn. mat.	4097	35.56	1283	17.82	37*	
	PLAN Students (N=58 classrooms)		Control Students (N=28 classrooms)			
					U	z
1. Comp. mat. 2. Learn. mat. 3. Learn. mat.	16878	40.42	4979	24.77	350	4.26**

* $p < .05$

** $p < .01$

Table 7

Comparison of PLAN Intermediate Level Students with Control Intermediate Level Students

Category	Student Observation Scale					
	Frequency	Percent	Frequency	Percent	Mann-Whitney	
	PLAN Intermediate Students (N=21 classrooms)		Control Intermediate Students (N=10 classrooms)			
Working Alone					U	z
1. Comp. mat.	85	0.56	00	00	15.0	4.01**
2. Learn. mat.	5742	37.97	2205	30.88	88.0	0.71
3. Learn. equip.	544	3.59	12	0.16	17.5	3.71**
4. Tests	596	3.94	0	0.00		
Interacting in a Group						
5. Attend. to tch.	670	4.43	2010	28.15		
6. Attend to stud.	313	2.07	1135	15.89		
7. Talk. or perf.	109	0.72	138	1.93		
Interacting with Teacher						
8. Content beh.	147	0.97	25	0.35		
9. Process beh.	45	0.29	11	0.15	70.0	1.51
10. Sil. att.	422	2.79	67	0.93		
Interacting with Peers						
11. Content beh.	574	3.79	106	1.48	38.0	2.83**
12. Process beh.	48	0.31	12	0.16	60.5	1.93*
13. Sil. att.	421	2.78	64	0.89		
Other						
14. Plan. learn. strat.	9	0.05	0	0.00	90.0	1.24
Transitional						
15. Walking	1574	10.41	354	4.95		
16. Wait. for tch.	561	3.71	161	2.25		
17. Other wait.	33	0.21	7	0.09		
18. Loc. or org. mat.	1667	11.02	326	4.56		
Non-productive						
19. Interacting	983	6.50	296	4.14		
20. Not interacting	577	3.81	211	2.95		
Alone (1+2+3+4)	6967	46.07	2217	31.05		
Group (5+6+7)	1093	7.22	3283	45.98		
Teacher (8+9+10)	614	4.06	103	1.44		
Peer (11+12+13)	1043	6.89	182	2.54		
Trans. (15+16+17+18)	3835	25.36	848	11.89		
Non-prod. (19+20)	1560	10.31	507	7.10		
TOTAL (1 through 20)	15120		7140			

*p<.05
**p<.01

Table 8

Comparison of PLAN Secondary Level Students with Control Secondary Level Students

Category	Student Observation Scale				
	Frequency	Percent	Frequency	Percent	Mann-Whitney
	PLAN Secondary Students (N=16 classrooms)		Control Secondary Students (N=10 classrooms)		U
Working Alone					
1. Comp. mat.	218	1.89	0	0.00	10.0**
2. Learn. mat.	3724	32.32	1238	17.19	43.0*
3. Learn. equip.	155	1.34	45	0.62	70.0
4. Tests	353	3.06	99	1.37	
Interacting in a Group					
5. Attend. to tch.	1122	9.73	3492	48.50	
6. Attend to stud.	620	5.38	508	7.05	
7. Talk. or perf.	116	1.00	120	1.66	
Interacting with Teacher					
8. Content beh.	89	0.77	14	0.19	
9. Process beh.	43	0.37	12	0.16	38.5*
10. Sil. att.	246	2.13	74	1.02	
Interacting with Peers					
11. Content beh.	543	4.71	75	1.04	8.5**
12. Process beh.	29	0.25	2	0.02	50.0
13. Sil. att.	367	3.18	58	0.80	
Other					
14. Plan. learn. strat.	18	0.15	0	0.00	65.0
Transitional					
15. Walking	680	5.90	195	2.70	
16. Wait. for tch.	258	2.23	134	1.86	
17. Other wait.	37	0.32	26	0.36	
18. Loc. or org. mat.	646	5.60	229	3.18	
Non-productive					
19. Interacting	1749	15.18	467	6.48	
20. Not interacting	507	4.40	412	5.72	
Alone (1+2+3+4)	4450	38.62	1382	19.19	
Group (5+6+7)	1858	16.12	4120	57.22	
Teacher (8+9+10)	378	3.28	100	1.38	
Peer (11+12+13)	939	8.15	135	1.87	
Trans. (15+16+17+18)	1621	14.07	584	8.11	
Non-prod. (19+20)	2256	19.58	879	12.20	
TOTAL (1 through 20)	11520		7200		

*p<.05
**p<.01

Table 9

Comparison of PLAN and Control Students (all Levels)

Category	Student Observation Scale					
	Frequency	Percent	Frequency	Percent	Mann-Whitney	
	PLAN Students (N=58 classrooms)		Control Students (N=28 classrooms)			
Working Alone					U	z
1. Comp. mat.	307	0.73	00		322	ties page 5.08**
2. Learn. mat.	14859	35.58	4817	23.96	484.5	3.02**
3. Learn. equip.	1712	4.09	162	0.80	349	4.32**
4. Tests	1014	2.42	99	0.49		
Interacting in a Group						
5. Attend. to tch.	2699	6.46	7428	36.95		
6. Attend to stud.	1246	2.98	2383	11.85		
7. Talk. or perf.	401	0.96	490	2.43		
Interacting with Teacher						
8. Content beh.	494	1.18	50	0.24		
9. Process beh.	139	0.33	30	0.14	466	3.27**
10. Sil. att.	1156	2.76	193	0.96		
Interacting with Peers						
11. Content beh.	1670	3.99	245	1.21	176	5.86**
12. Process beh.	133	0.31	14	0.06	378	4.20**
13. Sil. att.	1183	2.83	149	0.74		
Other						
14. Plan. learn. strat.	46	0.11	0	0.00	672	ties large
Transitional						
15. Walking	3882	9.29	821	4.08		
16. Wait. for tch.	1356	3.24	414	2.05		
17. Other wait.	116	0.27	80	0.39		
18. Loc. or org. mat.	3943	9.44	961	4.78		
Non-productive						
19. Interacting	3710	8.88	994	4.94		
20. Not interacting	1694	4.05	770	3.83		
Alone (1+2+3+4)	17892	42.84	5078	25.26		
Group (5+6+7)	4346	10.40	10301	51.24		
Teacher (8+9+10)	1789	4.28	273	1.35		
Peer (11+12+13)	2986	7.15	408	2.02		
Trans. (15+16+17+18)	9242	22.13	2276	11.32		
Non-prod. (19+20)	5459	13.07	1764	8.77		
TOTAL (1 through 20)	41760		20100			

*p<.05
**p<.01

STUDENT OBSERVATION SCALE

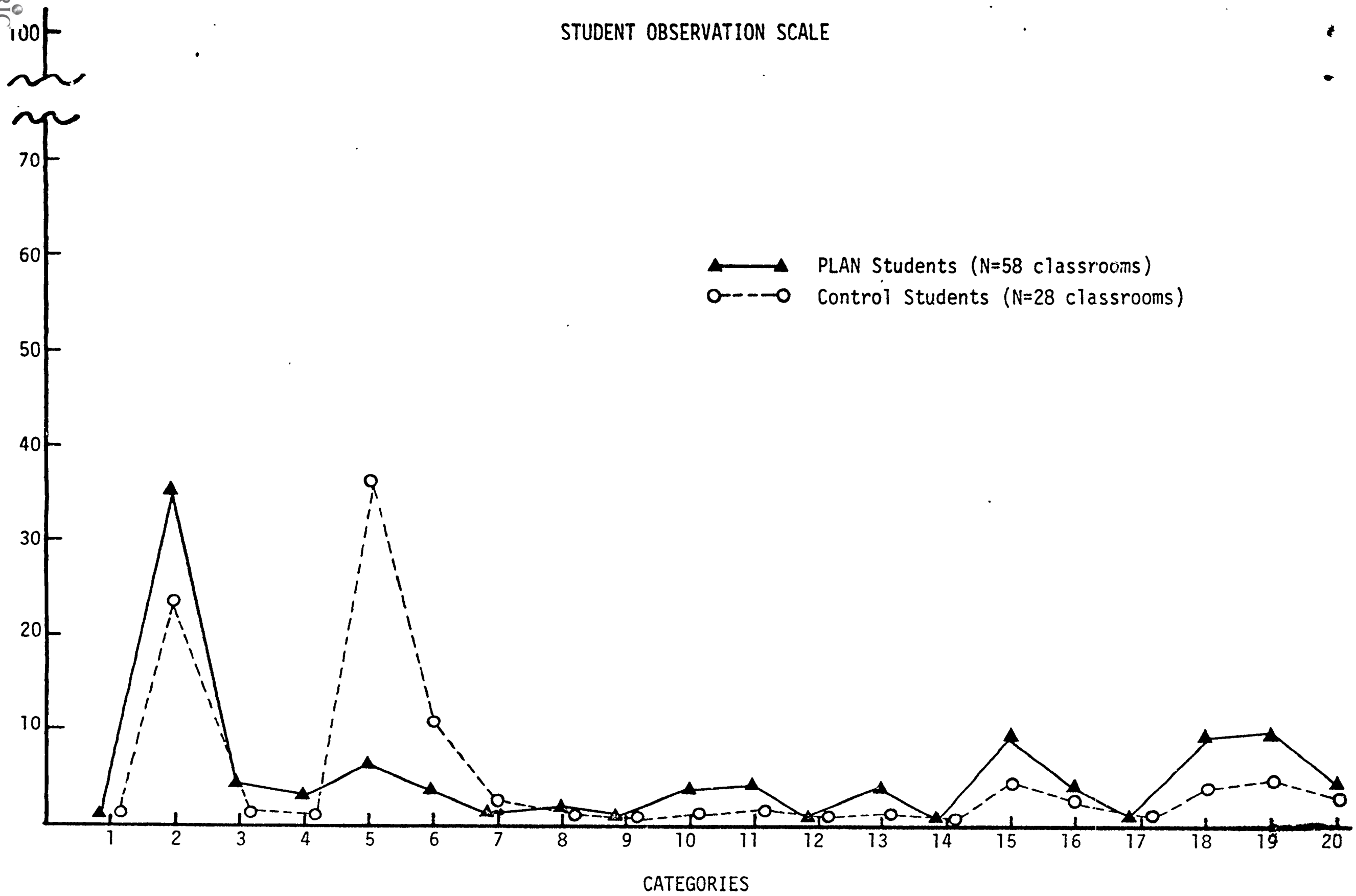

Fig. 1 Comparison and Plan and Control classrooms when Primary, Intermediate, and Secondary Levels are combined.

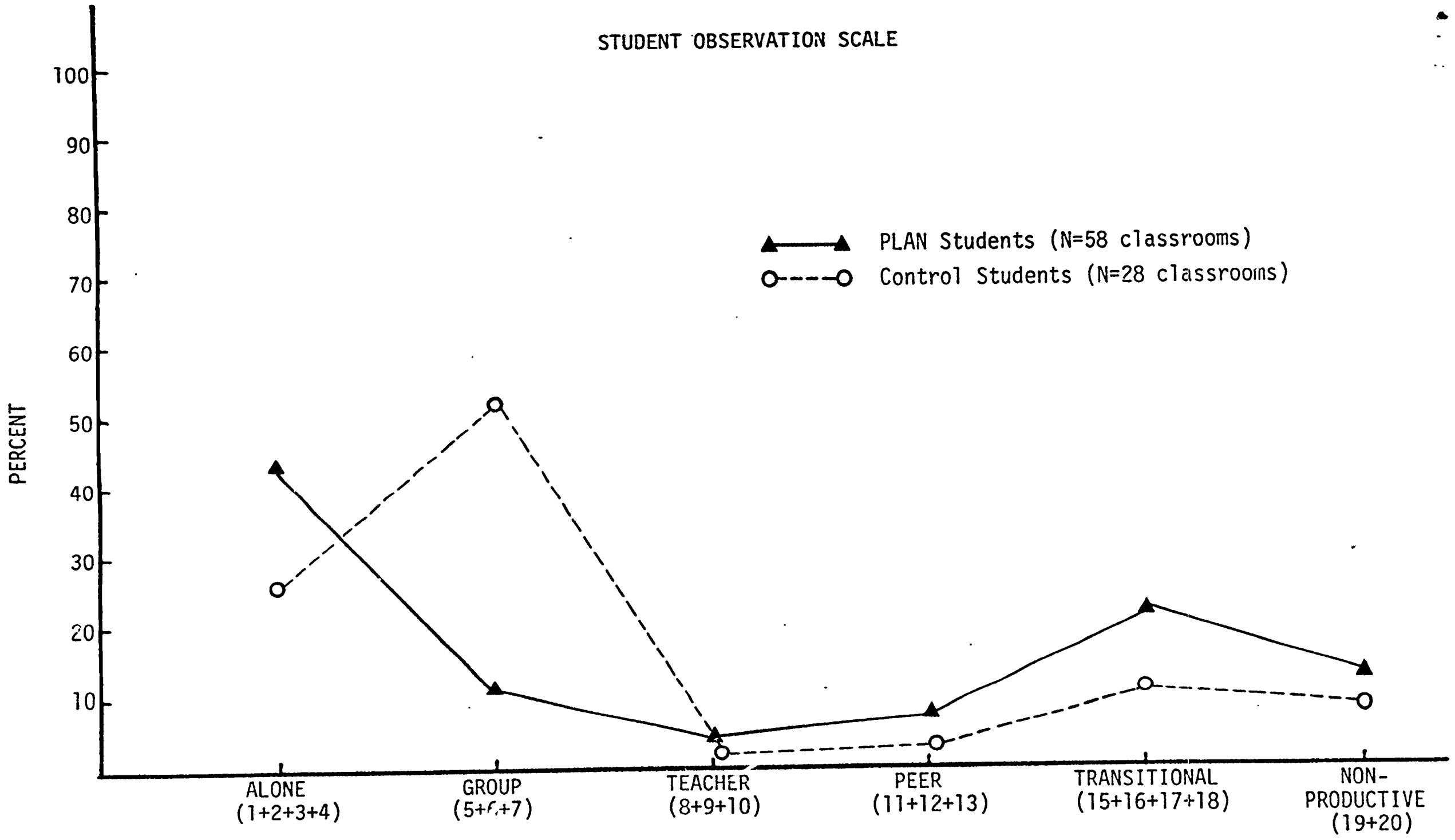

Fig. 2. Comparison of Plan and Control classrooms on combined categories when Primary, Intermediate, and Secondary Levels are combined.